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## Description

This invention relates in general to a lockset and more particularly to a lockset assembly in which the latch bolt is extendable into a dead bolt function.

With the usual latch bolt type lockset, the bolt extends about 12 mm ( $\frac{1}{2}$ ") from the front of the lock. Taking into consideration the gap that exists between the door jamb and the door, even less of the length of the latch bolt is available for engagement with the door jamb. Accordingly, with this type of lock, one possible way of obtaining unlawful entry is to spread the door jamb further away from the door to have the latch bolt clear the striker and the lock will no longer serve to maintain the door closed.

In view of the above, it has become increasingly popular to add an auxiliary dead bolt lock to the door. However, the use of such an auxiliary dead bolt does present some problems. For example, its use requires a second hole to be drilled in the door as well as requiring the mounting of an additional mechanism. Also it may require the use of a separate key if the latch bolt cylinder and the auxiliary dead bolt cylinder are not keyed alike. In addition, the latch bolt mechanism as well as the auxiliary dead bolt are normally capable of being locked on the inside. In an emergency situation, it would take two actions by the person in the inside to retract the latch bolt and auxiliary dead bolt to open the door and have egress therefrom. Furthermore, in some instances it may be desirable to provide for automatically operating a dead bolt upon the closing of the door, or indeed for selectively allowing it to be latched only.

US Patent No. 4,333,324 describes a spring/dead bolt assembly in which one part of the key-in-knob lock set functions in a normal manner such that when the lock set is unlocked, either the outside or inside knob can be manipulated to open the door by withdrawing the latch bolt from a normal spring latch extended position. When, instead, the lock set is locked, the latch bolt is extended an exceptionally long distance into the frame to a dead bolt position. Extension and retraction of the latch bolt to and from dead bolt position is accomplished by manipulation of a main cam through the agency of a key in the outside or a turn button on the inside.

It is an object of the present invention to provide an improved lockset assembly which functions both as a latch bolt and a dead bolt.

More specifically, it is an object of the present invention to provide a lockset assembly in which the latch bolt is automatically extendable into a dead bolt position when the door is closed.

Yet another object of the present invention is to provide a lockset assembly in which the latch bolt is automatically extendable into a dead bolt position when the door is closed and will remain in the latching position when the door is open.

A further object of the present invention is the provision of a lockset assembly in which when an

operating member is in the "lock" position, the latch bolt will move into its dead bolt position automatically when the door is closed, and when the operating member is in the "unlock" position, the latch bolt will remain in the latching position after the door is closed.

Yet another object of the present invention is the provision of a lockset utilising a latch assembly having a latch bolt movable into an extended dead bolt position and including means for maintaining the latch bolt in its intermediate latching position.

The invention provides:-

a lockset for a door which comprises by a latch bolt assembly comprising

a bolt movable between a partially extended latching position, a fully extended dead bolt position, and a retracted position,

spring means biasing said bolt toward its dead bolt position,

a spindle extending through said latch assembly in a direction transverse of the direction of movement of said bolt,

means connecting said spindle to said bolt for moving said bolt between its positions upon rotation of said spindle,

and means for normally biasing said latch bolt in its latching position, including means for holding said latch bolt in its latching position when said door is open, characterised in that the lock set further comprises means effective in response to closing of said door when said lockset is in a locked state, to cause the latch bolt to be moved automatically into its dead bolt position.

These and other objects of the present invention may be accomplished by the provision of the lockset to be described below with reference to the accompanying drawings.

In the accompanying drawings:

Figure 1 is a plan view looking down upon the lockset assembly showing it mounted within the door and its association with the door jamb;

Figure 2 is a horizontal sectional view taken along the horizontal axis of the lockset showing the lockset mounted within a metal door frame;

Figure 3 is a horizontal exploded plan view showing the various subassemblies of the lockset of the present invention;

Figure 4 is a perspective exploded view showing the various subassemblies of the lockset of the present invention;

Figure 5 is a perspective exploded view of the outside actuating assembly of the lockset of the present invention;

Figure 6 is a perspective exploded view of the inside actuating assembly of the lockset of the present invention;

Figure 7 is a view taken along the lines 7-7 of Figure 2 with the rose removed showing the position of the elements of the outside operating cassette when the lockset is in its dead bolt position;

Figure 8 is a view similar to that of Figure 7 but showing the outside cassette with the rack plate removed;

Figure 9 is a view similar to Figure 7 but showing the position of the components of the outside operating cassette when the latch bolt is in the latching position;

Figure 10 is a view similar to that of Figure 7 but showing the position of the components of the outside operating cassette when the latch bolt has been retracted into its open or retracted position by the hand-operated mechanism;

Figure 11 is a view taken along the lines 11—11 of Figure 2 with the rose removed and showing the positions of the components of the elements of the inside cassette when the lockset is in its dead bolt position;

Figure 12 is a transverse sectional view taken along the lines 12—12 of Figure 11;

Figure 13 is a view similar to Figure 11 but showing the components of the inside operating cassette when the latch bolt is in the latching position;

Figure 14 is a view similar to that of Figure 11 but showing the position of the components of the inside operating cassette when the latch bolt has been retracted into its open or retracted position by the hand-operated mechanism;

Figure 15 is a perspective view of the turn button assembly used in connection with the inside operating assembly of the lockset;

Figure 16 is a side view in elevation of the latch bolt assembly with the latch bolt in its dead bolt or fully extended position;

Figure 17 is a view similar to that of Figure 16, but showing the latch bolt in its latching position;

Figure 18 is a view similar to that of Figure 16, but showing the latch bolt in its open or fully retracted position;

Figure 19 is a view similar to that of Figure 16, but showing a bolt moving forward to its fully extended position after the door has been closed;

Figure 20 is an end view of the latch assembly taken along the lines 20—20 of Figure 16;

Figure 21 is a view showing the relationship of the turn button actuator with respect to the pinion extension when the turn button is in the locked position;

Figure 22 is a view similar to Figure 21 but showing the relative position of the turn button actuator with respect to the pinion extension when the turn button is in the unlocked position;

Figure 23 is a cross-sectional view of the latch assembly;

Figure 24 is an elevational view, partially in section of a modified form of a latch assembly for different function and showing the latch bolt in its extended dead bolt position; and

Figure 25 is a view similar to Figure 24, but showing the latch bolt in its intermediate latching position.

Referring to the drawings and in particular Figure 1, the lockset mechanism 1 of the present invention is shown mounted in a door 2 and includes an outside hand-operated member 4 and an inside hand-operated member 6 which in the preferred embodiment are an outside lever 8 and an inside lever 10. The outside and inside levers 8

and 10 are used to retract a latch bolt 12 of the latch bolt assembly 14 of the lockset mechanism from a striker box 16 and striker plate 18 mounted on the door jamb 20 in conventional fashion. According to the embodiment shown herein, the outside operating assembly 27 of the lockset may be provided with a key-operated lock cylinder 22 mounted within the outside lever 8 and the inside operating assembly 44 of the lockset may be provided with a turn button 26 mounted within the inside lever 10. The lock cylinder 22 and turn button 26 may be used to move the latch bolt 12 between its extended dead bolt position shown in full lines in Figure 1 and its latching position shown by the dotted lines in Figure 1.

Referring now to Figures 2, 3, and 4, the outside operating assembly 27 includes the outside lever 8 which is rotatably mounted within an outside rose 28 and includes a generally square-shaped projection 30 extending into the outside rose 28 and is held in place for rotational motion with respect thereto by a retaining ring 31. Positioned within the outside rose 28 is an outside operating cassette 32 having upper and lower ear-like projections 34 and 36 respectively extending therefrom which fit into suitable grooves 38 and 40 respectively on the outer surface of a latch bolt assembly holder 42 which is positioned within the door 2. A generally circular raised portion 43 is provided on the inside surface of the outside rose 28 which extends into a mating circular groove 45 in the outside surface of the outside operating cassette 32 to provide radial alignment of the two members. The latch bolt assembly holder 42 provides a mechanism for mounting the latch bolt assembly 14 which contains the latch bolt 12 and includes a suitable slot 47 into which the latch bolt assembly 14 may be inserted.

In a similar manner, an inside operating assembly 44 includes the inside lever 10 which is pivotally mounted within an inside rose 46 and includes a generally square-shaped projection 48 extending thereinto and which has a retaining ring 50 attached thereto so that the inside lever 10 is mounted for relative rotation with respect to the inside rose 46 in a like manner as the outside operating assembly 27. An inside operating cassette 52 is mounted within the inside rose 46 and includes upper and lower ear-like projections 54 and 56 respectively which extend into the grooves 38 and 40 on the latch bolt assembly holder 42. A generally circular raised portion 57 is provided on the inside surface of the inside rose 46 which extends into a mating circular groove 59 in the outside surface of the inside operating cassette to provide radial alignment of the two members. A spindle 58 extends through the latch bolt assembly 14 and between the inside and outside operating cassettes 32 and 52 in a direction perpendicular to the axis of movement of the latch bolt 12.

Before going into the details of the respective inside and outside operating assemblies 27 and 44 as well as the latch bolt assembly 14, the basic assembly of the lockset within the door 2 will be

described. Assuming that the lockset 1 is to be mounted on a metal door 2, such as shown in Figures 1 and 2, and that the proper openings have been provided in the door, the lockset 1 of the present invention may be mounted as follows. It should be noted that although the lockset 1 of the present invention is shown mounted in a left-handed door 2, it is applicable to doors of any configuration.

The outside operating cassette 32 is mounted on the latch bolt assembly holder 42 with the projections 34 and 36 received within the grooves 38 and 40 respectively of the holder 42. A roll pin 60 extends through the lower projection 36 into slot 62 formed in the bottom of the groove 40. This permits the outside operating cassette 32 to have limited relative movement with respect to the latch bolt assembly holder 42 while maintaining the outside operating cassette 32 and the latch bolt holder 42 together as a subassembly. With the outside operating cassette 32 positioned against the surface outside of the door 2 and the latch bolt assembly holder 42 positioned within the frame of the door 2, the latch bolt assembly 14 may be inserted into the latch bolt assembly holder 42 and secured thereto by means of a screw 64. After the spindle 58 is inserted through the latch bolt assembly 14, the inside operating cassette 52 is positioned on the inside surface of the door 2 with its projections 54 and 56 extending into the grooves 38 and 40 on the latch bolt assembly holder 42.

The outside rose 28 to which the outside lever 8 is attached includes upper and lower internally threaded posts 66 extending in a direction perpendicular to the axis of movement of the latch bolt assembly 14. When the outside rose 28 is mounted over the outside operating cassette 32, the posts 66 extend into openings 68 in the outside operating cassette 32. The inside rose 46 has upper and lower openings 70 therein which align with openings 72 in the inside operating cassette 52 when the inside rose 46 is mounted thereon. Screw members 74 extend through the openings 70, 72 in the inside rose 42 and the inside operating cassette 48 into threaded engagement with the posts 66 on the outside rose 28.

As it is typical in the art, the lever portion 75 of each of the lever handles 8 and 10 extend horizontally in a direction opposite to the extension of the latch bolt 12. As the inside and outside operating cassettes 32 and 52 are moveable relative to the latch bolt assembly holder 42 in a direction perpendicular to the axis of the latch bolt assembly 14, the lockset 1 will mount properly on doors regardless of variations in door thicknesses. It should also be noted that the latch bolt assembly 14 is positively mounted with the latch bolt assembly holder 42 by means of the screw 64 and also the inside and outside operating cassettes 32 and 52 are held in proper alignment with the latch bolt assembly holder 28 by means of the projections 34, 36 and 54, 56 mating with the grooves 38 and 40 in the latch

bolt assembly holder 42. This helps ensure proper alignment of the various components for insertion of the spindle 58.

Referring to Figure 2 the inside operating cassette 52 includes a cover 78 and outside operating cassette 32 includes a cover 76 both of which are provided with two spaced tabs members 80 extending inwardly therefrom into engagement with a mating slot 82 in the metal frame of the door 2 adjacent the opening therein. The engagement of the tabs 80 with the slots 82 help prevent the roses 28 and 46 and the inside and outside operating cassettes 32 and 52 from rotating relative to the door.

Referring now to Figures 2 and 5, the outside operating cassette 32 includes a housing 84 which has a central opening 86 into which the projection 30 of the outside lever 8 extends. The inside of the housing 84 includes a counterbore 88 concentric with the opening 86 and spaced wall portions 90 and 92 extending forwardly from the counterbore 88 in the direction of the extension of the latch bolt 14. The wall portions 90 and 92 taper outwardly and away from each other forming a V-shaped outer guideway 94. The inside surface of the housing 84 is also formed with a second set of opposed wall portions 96 and 98 spaced axially inwardly of said wall portions 90 and 92. The forward portions of the wall portions 96 and 98 are spaced apart a greater distance than the rearward portions forming upper and lower stop shoulders 100 (see Fig. 8). A rear wall portion 101 closes the end of an inner guideway 103 formed by the wall portions 96 and 98.

An actuating member 102 is mounted in the inner guideway 94 with a boss 105 thereof mounted in the opening 86 in the housing 84 and includes a generally square-shaped opening 104 into which extends the generally square-shaped projection 30 of the outside lever 8. The actuating member 102 includes a base portion 106 and a reduced elongated tail portion 110 which extends from the base portion 106 and is positioned within the V-shaped outer guideway 94. The forward end of the tail portion 110 is provided with a raised V-shaped cam surface 112 extending inwardly past the T plane of the inner surface of the tail portion 110.

A spring plate 114 is mounted within the housing 84 of the outside operating cassette 32 in the inner guideway 103 in overlapping relationship with the actuating member 102. At its forward end the spring plate 114 includes two spaced fingers 116 and 118 each having a cam follower surface 120 thereon adapted to be engaged by the V-shaped cam surface 112 on the actuator member 102. The spring plate 114 is biased forwardly in the direction of extension of the latch bolt 14 into engagement with the cam surface 112 on the actuating member 102 by means of two lever springs 122 and 124 each of which is positioned in a suitable groove 126 provided in the housing 84 and extends from the rear wall portion 101 to the rearward end 128 of the spring plate 114.

The spring plate 114 has a cutout portion 130 in

both its upper and lower side edges which form tab-engaging surfaces 132. The side edges ride between the wall portions 96 and 98 (see Fig. 8) with the forward end of the spring plate 114 being wider than the rearward end. The shoulders 134 formed between the wider forward portion and narrow rearward portion of the spring plate 114 form stop surfaces 135 for abutting the stop shoulders 100 formed in the housing 84.

A generally flat rack plate 136 is mounted within the housing 84 in the guideway 103 in overlapping relationship with the spring plate 114. The upper and lower edges of the rack plate 136 have outward extending tab portions 138 extending outward into the cutout portions 130 in the spring plate 114 in a position to be engaged by the tab-engaging surfaces 132 provided on the spring plate 114. The rack plate 136 also has a generally rectangular internal cutout 140, with the longer sides extending parallel to the axis of the latch bolt assembly 14. Gear teeth 142 are provided on the rack plate 136 adjacent one of the longer sides of the cutout 140 forming a rack which extends parallel to axis of the latch bolt assembly 14. Similar to the spring plate 114, the rack plate 136 is wider at its forward end between which and its narrower rearward end are formed stop shoulders 144 (see Fig. 7) adapted to abut the stop shoulders 100 formed in the housing 84. The forward end of the rack plate is provided with a notch 146 into which extends a lug portion 148 extending inwardly from the forward end of the actuating member 102 when the rack plate is in its forward position shown in Figure 7 to prevent rotation of the actuating member 102. The rack plate 136 is biased into its forward position by a spring member 149 positioned in suitable groove 151 in the housing 84 and extending between the rear wall portion 101 of the housing 84 and the rearward end of the rack plate 136.

A pinion member 150 extends perpendicular to the axis of the latch bolt assembly 14 and is mounted within the outer operating cassette 32 and includes a set of gear teeth 152 which are in mating engagement with the gear teeth 142 on the rack plate 136. The pinion member 150 also includes a tubular extension portion 154 which extends through the spring plate 114, actuating member 102, and housing 84 into an opening 155 in the outside lever 8.

The pinion member 150 includes a head portion 156 which is contained within the inside of a boss 158 which extends inwardly on the cover member 78 which provides a bearing surface for the head portion 156. The head portion 156 of the pinion member 150 has a generally rectangular slot 160 therein of a mating cross-section with that of the spindle 58 which extends therethrough. The tubular extension portion 154 includes opposed ribs 162 therein which are engagable by a drive member 164 connected to the lock cylinder 22 in the outside lever 8 to rotate the pinion member 150 between its unlocked and dead bolt positions.

In accordance with the above described arrangement, the actuating member 102 has

pivotable movement about the axis of the spindle 58 and is operably attached to the outside lever 8. The spring plate 114 and rack plate 136 are mounted within the housing 84 for rectilinear motion in a direction parallel to the motion of the latch bolt 12 of the latch bolt assembly 14. To provide for a smooth action, the wall portions 96 and 98 of the housing 84 include wear 165 pads inserted therein which guide the spring plate 114 and rack plate 136 as shown in particularly in Figures 7 and 8. The wear pads 165 may be fabricated from a suitable antifriction material such as Delrin which is a polyacetal.

The cover member 76 for the outside operating cassette 36 is provided with suitable cutout portions 166 through which the projections 34 and 36 extend to contain the operative parts of the operating housing as a unit. The cover member 76 is attached to the housing 84 by means of screws 168 extending through the cover member 76 into threaded bores 170 within the housing 84.

Referring to Figures 2 and 6 in particular, the inside operating assembly 44 includes the inside rose 46 and the inside lever 10 attached thereto in a similar manner as the outside operating assembly by a retaining ring 50. The inside operating cassette 52 includes basically the same elements and is constructed similar to that of the outside operating cassette 32 which has been described above. Accordingly, the description of the various components of the inside operating cassette 52 will be relatively brief except for the differences between it and the outside operating cassette 32, which will be pointed out in more explicated detail below.

The inside operating cassette 52 includes a housing 172 having the projections 54 and 56 extending therefrom and in which is mounted for pivotal movement an inside actuating member 174 in a guideway 176 similar to that described above in connection with the outside actuating member 102. The inside actuating member 174 includes a central generally square-shaped opening 178 into which the square-shaped projection 48 of the inside lever 10 projects as well as a raised V-shaped cam portion 180. A spring plate 182 having cam surfaces 183 for engagement with the cam surface 180 on the actuating member 174 is mounted in a guideway 184 in the housing 172. As in the case of the outside operating mechanism, the spring plate 182 is spring-biased forwardly by spring members 186. The spring plate 182 also includes a cutout portion 188 in each of its side edges forming tab-engaging surfaces 190 and stop shoulders 192 adapted to engage stop shoulders 194 (see Fig. 11) in the housing 172.

A rack plate 196 having gear teeth 198 provided adjacent a rectangular cutout 200 forming a rack 202 is mounted in the guideway 184 overlapping the spring plate 182. The rack plate 196 is spring-biased forwardly by a spring member 204. The rack plate 196, also includes stop shoulders 205 adapted to engage the stop shoulder 194 in the housing 172 and outwardly extending tabs 206

extending into the cutout portions 188 in a position to be engaged by the tab-engaging portions 190 of the spring plate 182.

The guideway 184 also includes wear inserts 207 of the same type as described in connection above in connection with the outside housing 84. However, in contrast to the rack plate 136 of the outside operating assembly 27, the forward end of the rack plate 196 of the inside operating assembly 44 is foreshortened and does not include a notch so that when it is in its forward dead bolt position as shown in Figure 11 and the tabs 206 are in engagement with the tab-engaging surfaces 190 of the spring plate, the forward end does not come into engagement with the lug portion 209 on the actuating member 174. As a result, the actuating member 174 is free to pivot when the rack plate 196 is in its forward dead bolt position.

A pinion member 210 includes gear teeth 212 thereon in mating engagement with the teeth 198 on the rack plate 196. The pinion member 210 includes a tubular extension 213 having opposed ribs 214, 216 therein which extend through the inside operating cassette 52 into an opening 218 in the inside lever 10. The pinion member 210 further includes a head portion 220 which is contained within the boss 221 of the inside cover 78. The cover 78 is attached to the housing 172 by means of screws 222 which are threadably engaged with the housing 172. The head portion 220 of the pinion member 210 also includes a slot 224 through which one end of the spindle 58 extends.

Referring to Figures 2 and 15, the turn button 26 includes a knob 226 having a rod 228 extending inwardly therefrom. The end of the rod 228 includes two opposed radial extending ear portions 230 and 232 for engaging the opposed ribs 214 and 216 in the tubular extension 212 of the inside pinion member 210. A cam member 234 is mounted on the rod 228 having a cam slot 236 therein. A cam follower 238 in the form of a roll pin extends radially out from the rod into the cam slot 236. A spring 240 is provided between the cam member 234 and the knob 226 to bias the knob 226 outwardly.

The cam member 234 includes a bump 242 on its circumference which mates with an indentation 244 in the opening 218 in the inside lever 10 to prevent rotation of the cam member 234 with respect to the lever 10. The cam member 234 also includes inwardly projecting tongues 246 having shoulders 248 thereon. The turn button 26 is mounted in the opening 218 of the inside lever 10 with the body 250 of the cam member 234 engaging an outwardly facing shoulder 252 in the lever 8 and the shoulder 248 on the tongues 246 engaging an inwardly facing shoulder 254 in the lever 10. When mounted in the lever 10, the rod 228 extends into the pinion member 210 of the inside operating assembly.

The cam slot 236 extends partially around the circumference of the body 250 of the cam member and includes a generally straight portion

256 and an outwardly extending detent portion 258 which acts as a detent for the cam follower 238. When the knob 226 is rotated from its locked position to its unlocked position, the cam follower 238 will reach the outwardly extending detent portion 258. At this point, the knob 226 and rod 228 will move outwardly under the force of the spring 240, releasably holding the knob 226 in the unlocked position.

Referring to Figures 2 and 16-18, the latch bolt 12 of the latch bolt assembly 14 is shown movable between an extended position in Figure 16, a latching position in Figure 17 and an open position in Figure 18. The latch bolt assembly 14 includes a latch case 260 having two spaced latch plates 262 and 264 (Figure 2) extending rearwardly therefrom. The latch plates 262 and 264 are held mounted together by means of bushings 266. The latch bolt assembly 14 is mounted within the slot 43 in the latch bolt assembly holder 42 with the screw 64 which attaches the latch bolt assembly 14 to the latch bolt assembly holder 42 extending through the rearward one of the bushings 266.

A hub member 268 upon which two lever plates 270 are mounted for rotation therewith is mounted between the two latch plates 262 and 264 in suitable openings 272 therein. The hub member 268 has a generally rectangular bore 274 therethrough of a shape to receive the spindle 58. The bolt 12 is mounted within the latch case 260 and has an arm 276 extending rearwardly therefrom toward the lever plates 270. The arm 276 is pivotally attached at its forward end to the bolt 12 and at its rearward end has a pivot pin 278 extending through an elongated slot 280 in the lever plate 270. A guide 282 having opposed side walls in which the arm 276 is positioned is also pivotally attached to the rearward end of the bolt. A spring-biased dowel 284 is mounted in the bolt 12 and has its end face engaging one corner on the forward portion of the arm 276. This serves to bias the arm 276 in a direction such that the pivot pin 278 will engage the upper edges 286 of the latch plates 262 and 264.

The upper edges 288 of the latch plates 262 and 264 each include a rearward cutout portion 286 forming rearward facing stop shoulders 388 which are engagable by the pin 276 to stop the latch bolt 12 in its partially extended latching position. Forward of the cutout portion 286 the upper edges slope downwardly toward another cutout portion which forms a notch 290 to releasably retain the bolt 12 in the fully extended dead bolt position. A spring 391 extends between the side plates 262 and 264 and the latch bolt 12 to bias the bolt 12 toward its forward, dead bolt position.

A latch release plunger 392 is mounted in a slot 394 in the bolt and has a forwardly extending striker-abutting portion 396 extending forwardly out of the latch case 260 and a cam portion 398 extending rearwardly from the case 260. The latch release plunger 392 is positioned on the side of the bolt 12 opposite the bevel thereof. The cam

portion 398 is forked and includes upper and lower rearward facing cam surfaces 402. An intermediate portion 404 of the latch release plunger 392 is channel-shaped and has a spring 406 mounted therein between a shoulder 408 and an intumed projection 410 on the latch case 260 to bias the latch release plunger 392 into its forward position. When the latch release plunger 392 is biased into its forward position, the forward face 412 of the cam portion 398 abuts the rear wall 414 (Fig. 10) of the latch case 260. In this position, the striker-abutting portion 396 extends outwardly adjacent the end of the bolt 12.

A pair of rearward facing shoulders 416 (Fig. 17) on the bolt 12 are adapted to engage a pair of forwardly facing shoulders 418 on the latch release plunger so that upon inward movement of the bolt 12 when it is being retracted from its latching position to its open position, it will move the latch release plunger 392 inwardly into its open position as seen in Figure 18. When the latch release plunger 392 is in its open position, the rearward facing cam surfaces 402 are rearward of the stop shoulder 388 on the latch plate 262.

In operation, when the door 2 is closed, and with the turn button 26 in its locked position, i.e. with the cam follower 238 in the straight portion 256 of the cam slot 236, the latch bolt 12 will be in its extended dead bolt position as shown in Figure 16 and the latch release plunger 392 will be held in its rearward open position by the striker 18. In this position, the outside lever 8 cannot be rotated since the rack plate 136 is in its forward position and the lug portion 148 on the actuating member 102 is positioned in the notch 146 thereof. This arrangement prevents the outside lever 8 from being turned since the actuating member 102 attached thereto cannot be rotated. As there is no notch in the rack plate 196 of the inside operating assembly 44, the inside lever 10 is free to rotate. Upon rotation of the inside lever 10, the actuating member 174 pivots about the axis of the spindle 58 and the cam portion 180 thereof engages the cam surfaces 183 on the ends of the spring plate 182 causing the spring plate 182 to move rearwardly in a linear direction. Due to the engagement of the spring plate 182 with the rack plate 196, the rack plate 196 also moves rearwardly in a linear direction causing the pinion member 210 to rotate thereby rotating the spindle 58 and the hub member 268 of the latch bolt assembly 14 causing the complete retraction of the latch bolt 12 into the position substantially as shown in Figure 18. When the door is opened and the operator releases the inside lever 10, the latch bolt 14 and latch release plunger 192 will move forward under the influence of their respective springs. The latch bolt 14 will move forward until the pivot pin 278 engages the stop shoulder 388 in the upper edges of the latch plates 262 and 264 thereby holding the latch bolt 14 in its latching position (Fig. 17). As the door is closed and moves past the striker 18, the latch bolt 14 and latch release plunger 392 are moved into their open position by the striker 18, as shown in Figure 18.

In this position, the pivot pin 278 is rearward of the cam surfaces 402 of the latch release plunger 392. When the door is completely closed, the latch bolt 14 moves forwardly under the influence of the latch spring 391 into the striker box 16, while the latch release plunger 392 is held in its rearward open position by the striker 18, as shown in Figure 19. To enable the bolt 12 to move forward into its dead bolt position without hindrance from the stop shoulder 388, the cam surfaces 402 on the latch release plunger 392 serve to enable the pivot pin 278 to ride up over the stop shoulder 388, thus enabling the pivot pin 278 to continue forward until it engages the forward pin-receiving notch 290, in which position the latch bolt 12 is in its fully extended dead bolt position. When the turn button 26 is moved into its unlocked position, in which the cam follower 238 is positioned in the detent portion 258 in the cam slot 236, due to the interconnection between the ear 230 and 232 portions on the rod 228 of the turn button 26 and the ribs 214 and 216 in the extension portion of the pinion member 210, the inside pinion member 210 will be rotated thereby rotating the spindle 58 to rotate the hub 268 of the latch assembly 14 into its latching position thereby retracting the latch bolt 12 into its latching position. In this position, the pinion member 210 and ears 230 and 232 on the rod 228 of the turn button 26 will be positioned as shown in Figure 22 so that rotation of the pinion member 210 in a clockwise direction is prevented by the ribs 214 and 216 engaging the ears 230 and 232 on the rod 228 of the turn button. Since the cam follower 238 must be manually released from the detent portion 258 in the cam slot 236 by depressing the knob 226 and turning, the latch bolt 12 will be held in its intermediate position even if the latch release plunger 392 is moved rearwardly as by closing the door. Thus, the latch bolt 12 moves forwardly from its open position only to its latching position when the turn button 26 is in its unlocked position.

When the latch bolt 12 is in its intermediate or latching position, the outside rack plate 136 is held in its intermediate position wherein the notch 146 is out of engagement with the lug portion 148 on the actuating member 102. Accordingly, the actuating member 102 is free to rotate whereby the outside lever 10 can be rotated to move the latch bolt 12 from its latching position to its open position to open the door.

The lock cylinder 22, by virtue of its drive member 164 engaging the ribs 162 of the outside pinion member 150, can be used to open the door when the door is locked with the latch bolt 12 in its fully extended dead bolt position. However, the cylinder 22 and key cannot be used to change the function from either locked to unlocked or from unlocked to locked.

Figures 24 and 25 show a modified form of a latch bolt assembly 420 which may be used when both the outside and inside operating assemblies 27, 44 utilise a key-operated cylinder member with a drive member extending therefrom into their respective inside and outside pinions to



engage the ribs. The latch bolt assembly is generally similar to that described in connection with Figures 16-19 and 21 and includes a latch case 260 having two spaced latch plates 262 and 264 extending rearwardly therefrom (only one (262) of which is shown). The latch plates are held mounted together by means of bushings 266. A hub member 268 on which two lever plates 270 (only one of which is shown) are mounted for rotation therewith, is mounted between the two latch plates in suitable openings therein. The hub member 268 has a generally rectangular bore 274 therethrough of a shape to receive the spindle 58. The bolt 12 is mounted with the latch case 260 and has an arm 276 extending rearwardly therefrom toward the lever plates 270. The arm 276 is pivotally attached at its forward end to the bolt 12 and at its rearward end has a pivot pin 278 extending through elongated slots 280 in each of the lever plates. A spring-biased dowel such as shown in the previous embodiment may be mounted in the bolt 12 and a bolt spring 391 extends between the side plates and the latch bolt 12 to bias the bolt 12 toward its forward dead bolt position. In this case, the hub 268 includes a generally V-shaped tab portion 422. A spring member 424 has an end portion wrapped partially around the rear bushing 266 with an intermediate portion wrapped around the screw 64 which attaches the latch bolt assembly 14 to the latch bolt assembly holder 42. The spring also includes a forwardly and downwardly extending intermediate portion 426 and a forward end portion 428 which extends generally vertical as shown in Figure 22.

When the latch bolt is in its fully extended dead bolt position, the tail on the hub engages the intermediate portion 426 of the spring 424 to bias the latch bolt into its forward position wherein the pivot pin 278 is positioned within a notch 430 in the forward end of the cutout portion 432 on the upper edges of the latch plates 262 and 264. When the latch bolt 12 is moved into its intermediate latching position, the tail piece engages the generally vertical portion 428 of the spring which biases the hub 268 against rotation in a clockwise direction into the open position thereby holding the latch bolt in its intermediate latching position. In this embodiment, the key-operated cylinders in either the inside or outside member can be used to retract the dead bolt from its extended position into the intermediate position and also can be used to move the hub member against the bias of the spring to move the dead bolt from its intermediate position into its locked position.

#### Claims

1. A lockset for a door which comprises a latch bolt assembly (14) comprising  
 a bolt (12) movable between a partially extended latching position, a fully extended dead bolt position, and a retracted position,  
 spring means (391) biasing said bolt (12) toward its dead bolt position,

a spindle (58) extending through said latch assembly (14) in a direction transverse of the direction of movement of said bolt,

means (268, 274) connecting said spindle (58) to said bolt (12) for moving said bolt (12) between its positions upon rotation of said spindle (58), and  
 means (388) for normally biasing said latch bolt (12) in its latching position, including means for holding said latch bolt (12) in its latching position when said door (2) is open, characterised in that the lock set further comprises

means (392, 402) effective in response to closing of said door (2) when said lockset is in a locked state, to cause the latch bolt (12) to be moved automatically into its dead bolt position.

2. A lockset according to Claim 1 characterised in that the latch bolt assembly (14) includes

a casing (260) having spaced side plates (262, 264) extending therefrom and in which a hub (268) forming part of the means connecting the spindle (58) and bolt (12) is mounted for rotation, said hub (268) including an opening (274) through which said spindle (58) extends,

lever means (270) extending from said hub (268), and

an arm (276) pivotally attached to said bolt (12) at one end and pivotally attached to said lever means (270) at the other, wherein the means (388) for holding the latch bolt (12) in its latching position comprises means (388) blocking rotation of said hub (268) into the dead bolt.

3. A lockset according to Claim 2 characterised in that the latch bolt assembly (14) includes a pivot pin (278) connecting said arm (276) and said lever means (270) and in that the side plates (262, 264) have a shoulder (388) thereon for engagement by said pivot pin (278) to hold said bolt (12) in said latching position.

4. A lockset according to Claim 3 characterised in that the latch bolt assembly (14) includes means (392, 402) to disengage said pivot pin (278) from said shoulder (388) upon closing of the door (2).

5. A lockset according to Claim 4 characterised in that the means (392, 402) to disengage includes a plunger (392) having a forward portion extending forwardly from said case (260) and a rearward portion (398) extending along said side plates (262, 264) and having a cam surface (402) thereon for engaging said pivot pin (278) when said pivot pin (278) is moving towards said shoulder (388) to lift said pivot pin (278) over said shoulder (388) and thus to permit said bolt (12) to move into its dead bolt position.

6. A lockset according to any one of Claims 2 to 5 characterised in that means (26) is provided which is movable to an unlocked position to prevent said bolt (12) from moving into its dead bolt position when said door (2) is closed.

7. A lockset according to Claim 6 characterised in that the unlocking means (26) comprises a turn button (26).

8. A lockset according to any one of the preceding Claims characterised in that inside and outside levers (8, 10) are provided, the outside lever



(8) being operably connected to said spindle (58) to move said bolt (12) from its latching position to its open position and the inside lever (10) being operably connected to said spindle (58) to move said bolt (12) from its dead bolt position to its open position.

9. A latch assembly for use with a lockset according to any one of the preceding claims comprising

a casing (260) having spaced side plates (262, 264) extending rearwardly therefrom,

a hub (268) with a tail piece (422) thereon, mounted for rotation in said side plates (262, 264) and having a lever means (270) extending therefrom,

a bolt (12) movable between an open, fully retracted position; a partially extended, latching position and a fully extended dead bolt position, and

an arm (276) pivotably attached at one end to said bolt (12) and at the other end to said lever means (270), characterised in that said latch assembly further comprises

spring means (426) mounted on said side plates (262, 264) for biasing said latch bolt (12) forward when it is in said dead bolt position, and biasing it against movement into its open position when it is in said latching position, and engaging said tail piece (422) when said bolt (12) is in said dead bolt and latching position.

#### Patentansprüche

1. Schloß für eine Tür mit einer Schnapperanordnung (14), welche einen Bolzen (12), der zwischen einer teilweise ausgefahrenen Sperrlage, einer vollständig ausgefahrenen Ruhelage und einer zurückgezogenen Lage bewegbar ist,

eine den Bolzen (12) zu seiner Ruhelage hin vorspannende Federeinrichtung (391), eine sich durch die Schnapperanordnung (14) in einer Richtung quer zur Bewegungsrichtung des Bolzens erstreckende Spindel (58), eine die Spindel (58) mit dem Bolzen (12) verbindende Einrichtung (268, 274), um den Bolzen (12) bei Drehen der Spindel (58) zwischen seinen Lagen zu bewegen und eine Einrichtung (388) umfaßt, welche den Bolzen (12) in seine Sperrlage vorspannt, wobei eine Einrichtung vorgesehen ist, um den Bolzen (12) in seiner Sperrlage zu halten, wenn die Tür (2) geöffnet ist, dadurch gekennzeichnet, daß

eine Einrichtung (392, 402) in Ansprechen auf das Schließen der Tür (2) wirksam ist, wenn sich das Schloß in einem verriegelten Zustand befindet, um den Bolzen (12) automatisch in seine Ruhelage zu bewegen.

2. Schloß nach Anspruch 1, dadurch gekennzeichnet, daß die Schnapperanordnung (14) ein Gehäuse (260), welches sich davon erstreckende und voneinander im Abstand angeordnete Seitenplatten (262, 264) aufweist und in welchem eine einen Teil der die Spindel (58) mit dem Bolzen (12) verbindenden Einrichtung bildende Nabe (268) zwecks Rotation angeordnet ist, wobei die Nabe (268) eine Öffnung (274) aufweist, durch

welche sich die Spindel (58) erstreckt, eine Hebelanordnung (270), die sich von der Nabe (268) erstreckt und einen Arm (276) umfaßt, welcher an einem Ende an dem Bolzen (12) schwenkbar befestigt ist und am anderen Ende mit der Hebelanordnung (270) schwenkbar verbunden ist, und daß die Einrichtung (388), welche den Bolzen (12) in seiner Sperrlage hält, eine Einrichtung umfaßt, um eine Rotation der Nabe (268) in die Ruhelage des Bolzens zu blockieren.

3. Schloß nach Anspruch 2, dadurch gekennzeichnet, daß die Schnapperanordnung (14) einen Drehzapfen (278) einschließt, welcher den Arm (276) und die Hebeleinrichtung (270) verbindet, und daß die Seitenplatten (262, 264) eine Schulter (388) zum Eingriff mit dem Drehzapfen (278) aufweist, um den Bolzen (12) in seiner Sperrlage zu halten.

4. Schloß nach Anspruch 3, dadurch gekennzeichnet, daß die Schnapperanordnung (14) eine Einrichtung (392, 402) zum Lösen des Drehzapfens (278) von der Schulter (388) bei Schließen der Tür (2) aufweist.

5. Schloß nach Anspruch 4, dadurch gekennzeichnet, daß die Einrichtung (392, 402) zum Lösen einen Plunger (392) mit einem sich nach vorn vom Gehäuse (260) erstreckenden vorderen Abschnitt und einem rückwärtigen Abschnitt (398) aufweist, der sich längs den Seitenplatten (262, 264) erstreckt und eine Nockenfläche (402) zum Ergreifen des Drehzapfens (278) aufweist, wenn sich der Drehzapfen (278) zu der Schulter (388) bewegt, um den Drehzapfen (278) über die Schulter (388) anzuheben und somit dem Bolzen (12) zu gestatten, sich in seine Ruhelage zu bewegen.

6. Schloß nach einem der Ansprüche 2 bis 5, dadurch gekennzeichnet, daß eine Einrichtung (26) vorgesehen ist, welche in eine Entriegelungslage bewegbar ist, um zu verhindern, daß sich der Bolzen (12) in seine Ruhelage bewegt, wenn die Tür (2) geschlossen ist.

7. Schloß nach Anspruch 6, dadurch gekennzeichnet, daß die Entriegelungseinrichtung (26) einen Drehknopf (26) aufweist.

8. Schloß nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß Innen- und Außenhebel (8, 10) vorgesehen sind, daß der Außenhebel (8) mit der Spindel (58) verbunden ist, um den Bolzen (12) aus seiner Sperrlage in seine Offenlage zu bewegen, und daß der Innenhebel (12) mit der Spindel (58) verbunden ist, um den Bolzen (12) aus seiner Ruhelage in seine Offenlage zu bewegen.

9. Schnapperanordnung für ein Schloß gemäß einem der vorhergehenden Ansprüche, mit einem Gehäuse (260), welches sich von ihm rückwärts erstreckende, im Abstand voneinander angeordnete Seitenplatten (262, 264) aufweist, einer Nabe (268) mit einem Endstück (422), die zwecks Rotation in den Seitenplatten (262, 264) angeordnet ist und eine sich davon erstreckende Hebeleinrichtung (270) aufweist, einem Bolzen (12), der zwischen einer vollständig zurückgezogenen Offenlage, einer teilweise

erstreckten Sperrlage und einer vollständig ausgefahrenen Ruhelage bewegbar ist, und

einem Arm (276), der mit einem Ende am Bolzen (12) und mit dem anderen Ende an der Hebeleinrichtung (270) schwenkbar befestigt ist, dadurch gekennzeichnet, daß

die Schnapperanordnung eine Federeinrichtung (426) aufweist, welche an den Seitenplatten (262, 264) angeordnet ist, um den Sperrbolzen (12) nach vorn vorzuspannen, wenn er sich in seiner Ruhelage befindet und ihn gegen Bewegung in seine Offenlage vorzuspannen, wenn er sich in seiner Sperrlage befindet, wobei die Federeinrichtung (426) mit dem Endstück (422) in Eingriff steht, wenn sich der Bolzen (12) in seiner Ruhe- und Sperrlage befindet.

#### Revendications

1. Serrure pour porte qui comprend un ensemble pêne demi-tour (14) avec

un pêne (12) qui peut se déplacer entre une position de demi-tour, en extension partielle, une position de pêne dormant ou en extension totale et une position rétractée,

des moyens à ressort (391) qui sollicitent ledit pêne (12) vers sa position de pêne dormant,

une tige (58) qui s'étend à travers l'ensemble pêne demi-tour (14), dans une direction transversale à la direction du mouvement de ce pêne,

des moyens (268, 274) qui relient cette tige (58) à ce pêne (12) pour déplacer ce pêne (12) entre ses positions en réponse à la rotation de cette tige (58), et

des moyens (388) servant à solliciter normalement ce pêne de demi-tour (12) vers sa position de demi-tour, qui comprennent des moyens servant à maintenir ce pêne demi-tour (12) dans sa position de demi-tour lorsque la porte (2) est ouverte, caractérisée en ce que la serrure comprend en outre:

des moyens (392, 402) qui agissent en réponse à la fermeture de la porte (2), lorsque cette serrure est dans un état verrouillé, pour faire en sorte que le pêne demi-tour (12) soit placé automatiquement à sa position de pêne dormant.

2. Serrure selon la revendication 1, caractérisée en ce que l'ensemble de pêne demi-tour (14) comprend:

un boîtier (260) possédant des plaques latérales espacées (262, 264) qui font saillie sur ce boîtier et dans lequel un moyeu (268) qui fait partie des moyens reliant la tige (58) et le pêne (12) est monté rotatif, ce moyeu (268) comprenant une ouverture (274) que traverse cette tige (58),

des moyens à leviers (270) qui font saillie sur ce moyeu (268),

un bras (276) articulé sur ce pêne (12) à une première extrémité et articulé sur ces moyens à leviers (270) à l'autre, dans lequel les moyens (388) servant à maintenir le pêne demi-tour (12) dans sa position de demi-tour comprennent des moyens (388) qui bloquent la rotation de ce moyeu (268) vers la position de pêne dormant.

3. Serrure selon la revendication 2, caractérisée

en ce que l'ensemble de pêne demi-tour (14) comprend un axe d'articulation (278) qui relie ces bras (276) et ces moyens à leviers (270) et en ce que les plaques latérales (262, 264) portent un épaulement (388) destiné à être attaqué par cet axe d'articulation (278) pour maintenir ce pêne (12) dans cette position de pêne demi-tour.

4. Serrure selon la revendication 3, caractérisée en ce que cet ensemble de pêne demi-tour (14) comprend des moyens (392, 402) pour dégager cet axe d'articulation (278) de cet épaulement (388) en réponse à la fermeture de la porte (2).

5. Serrure selon la revendication 4, caractérisée en ce que les moyens de dégagement (392, 402) comprennent un plongeur (392) possédant une partie avant qui fait saillie sur ce boîtier (260) vers l'avant et une partie arrière (398) qui s'étend le long de ces plaques latérales (262, 264) et portent une surface de came (402) destinée à attaquer cet axe d'articulation (278) lorsque ce dernier se déplace vers cet épaulement (388) pour soulever cet axe d'articulation (278) au-dessus de cet épaulement (388) et permettre ainsi à ce pêne (12) de venir prendre sa position de pêne dormant.

6. Serrure selon une quelconque des revendications 2 à 5, caractérisée en ce qu'elle est équipée de moyens (26) qui peuvent venir prendre une position déverrouillée pour empêcher ce pêne (12) de prendre sa position de pêne dormant lorsque la porte (2) est fermée.

7. Serrure selon la revendication 6, caractérisée en ce que les moyens de déverrouillage (26) comprennent un bouton tournant (26).

8. Serrure selon une quelconque des revendications précédentes, caractérisée en ce qu'elle est munie de leviers intérieur et extérieur (8, 10), le levier extérieur (8) étant accouplé fonctionnellement à cette tige (58) pour faire passer ce pêne (12) de sa position de demi-tour à sa position ouverte, et le levier intérieur (10) étant accouplé fonctionnellement à cette tige (58) pour faire passer ce pêne (12) de sa position de pêne dormant à sa position ouverte.

9. Ensemble de demi-tour destiné à être utilisé avec une serrure selon une quelconque des revendications précédentes, comprenant:

un boîtier (260) présentant des plaques latérales espacées (262, 264) qui s'étendent vers l'arrière à partir de ce boîtier,

un moyeu (268) portant une pièce de queue (422) monté pour tourner dans ces plaques latérales (262, 264) et sur lequel font saillie des moyens à leviers (270),

un pêne (12) qui peut se déplacer entre une position ouverte, entièrement rétractée; une position d'extension partielle ou de pêne demi-tour, et une position d'extension totale ou de pêne dormant, et

un bras (276) articulé à ce pêne (12) à une première extrémité et à ces moyens à leviers (270) à l'autre extrémité,

caractérisé en ce que cet ensemble de demi-tour comprend en outre des moyens à ressort (426) montés sur ces plaques latérales (262, 264) pour solliciter ce pêne demi-tour (12) vers l'avant

Fig.1

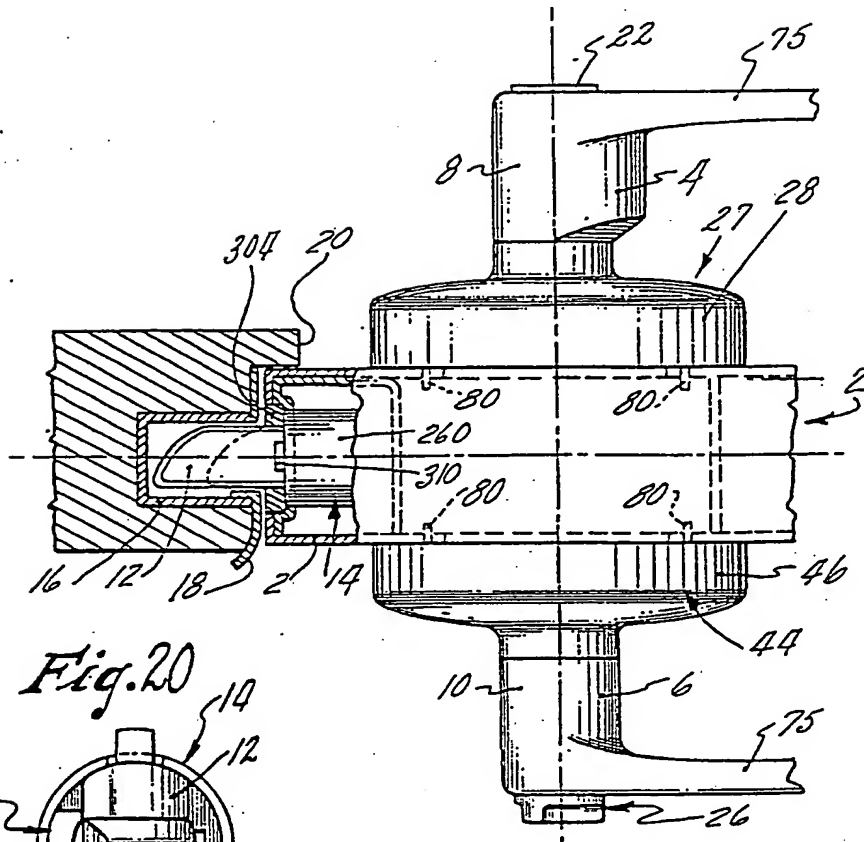


Fig.20

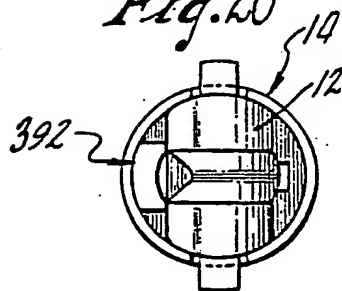


Fig.21

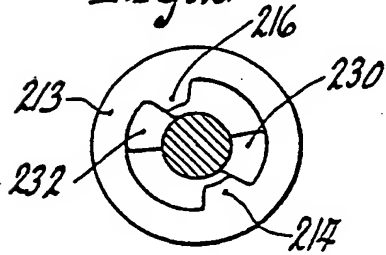
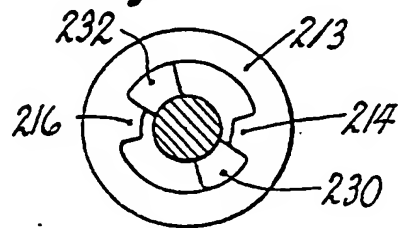


Fig.22



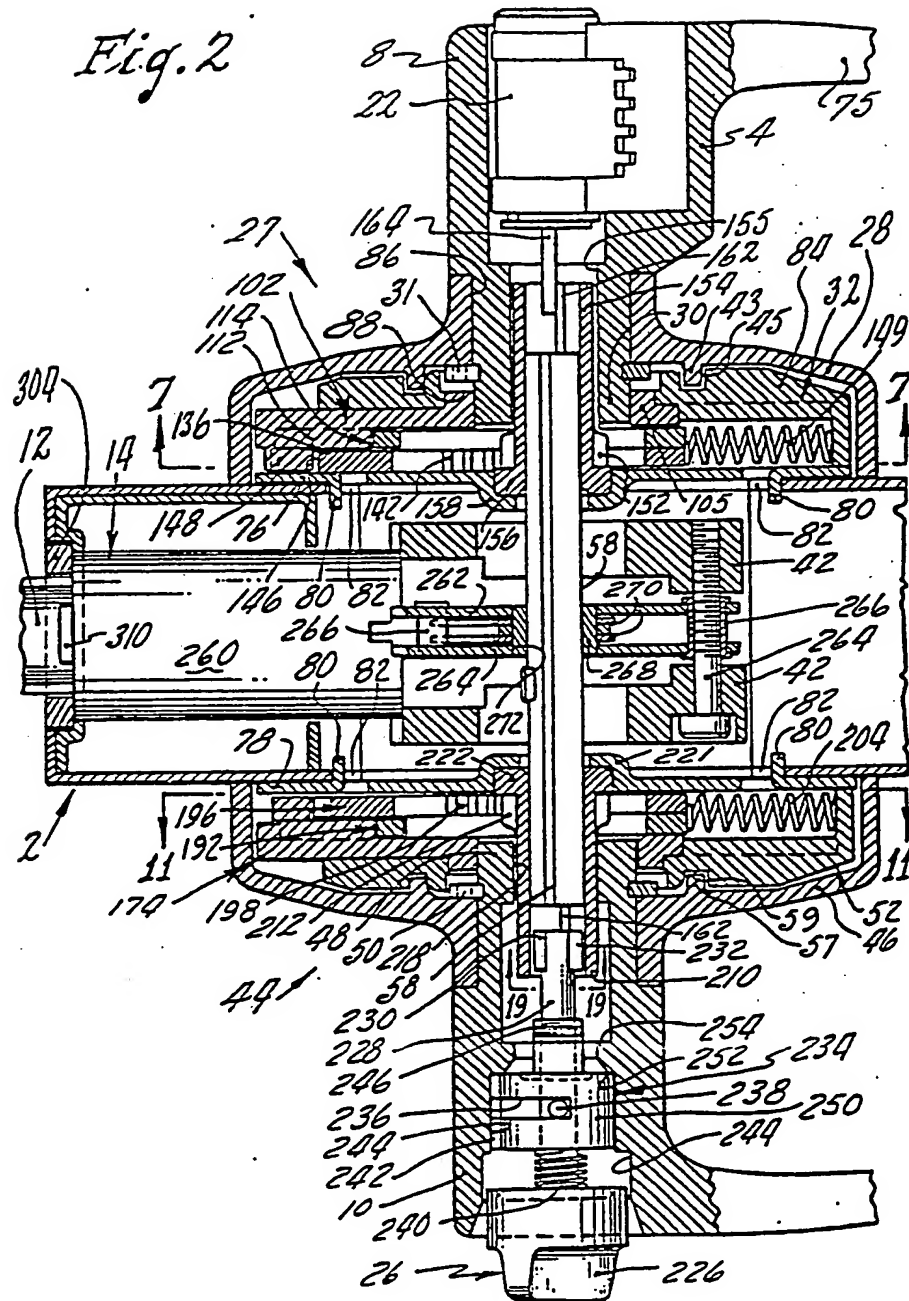
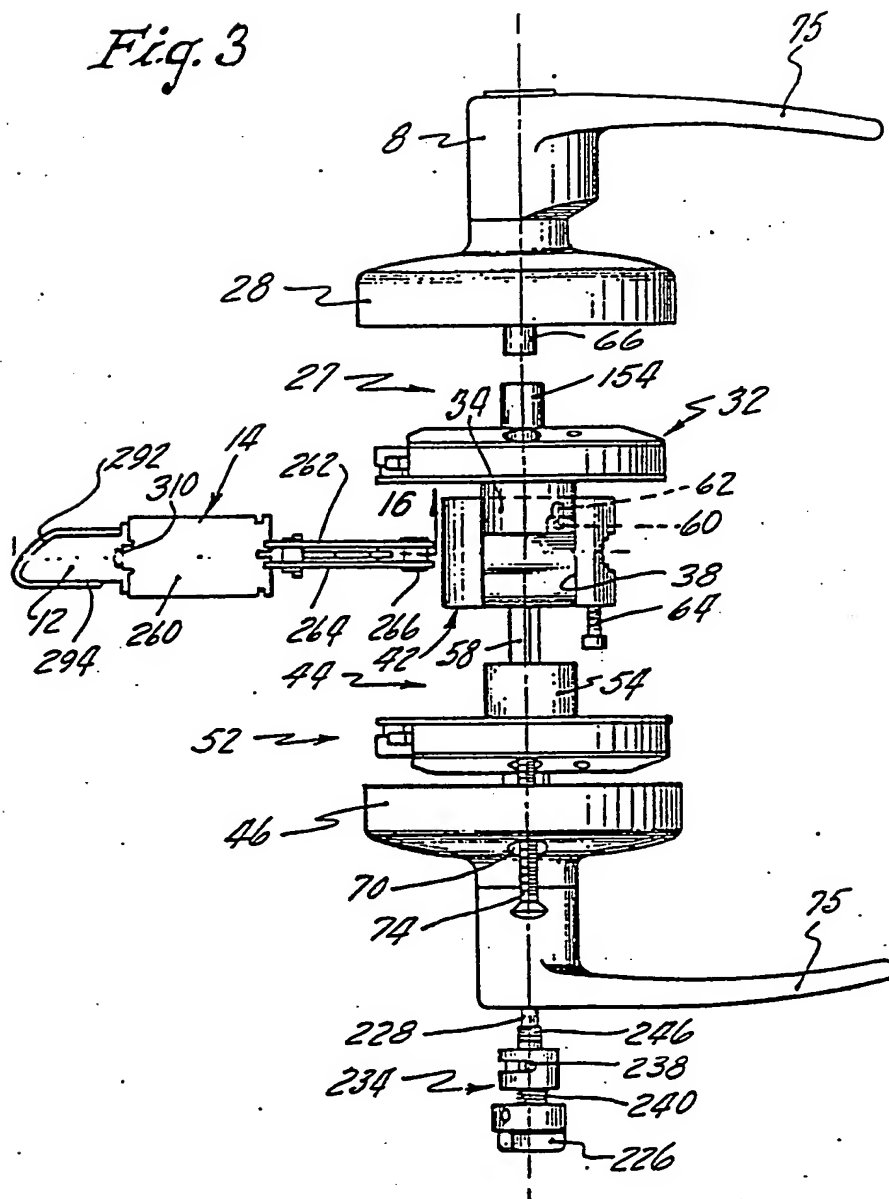


Fig. 3



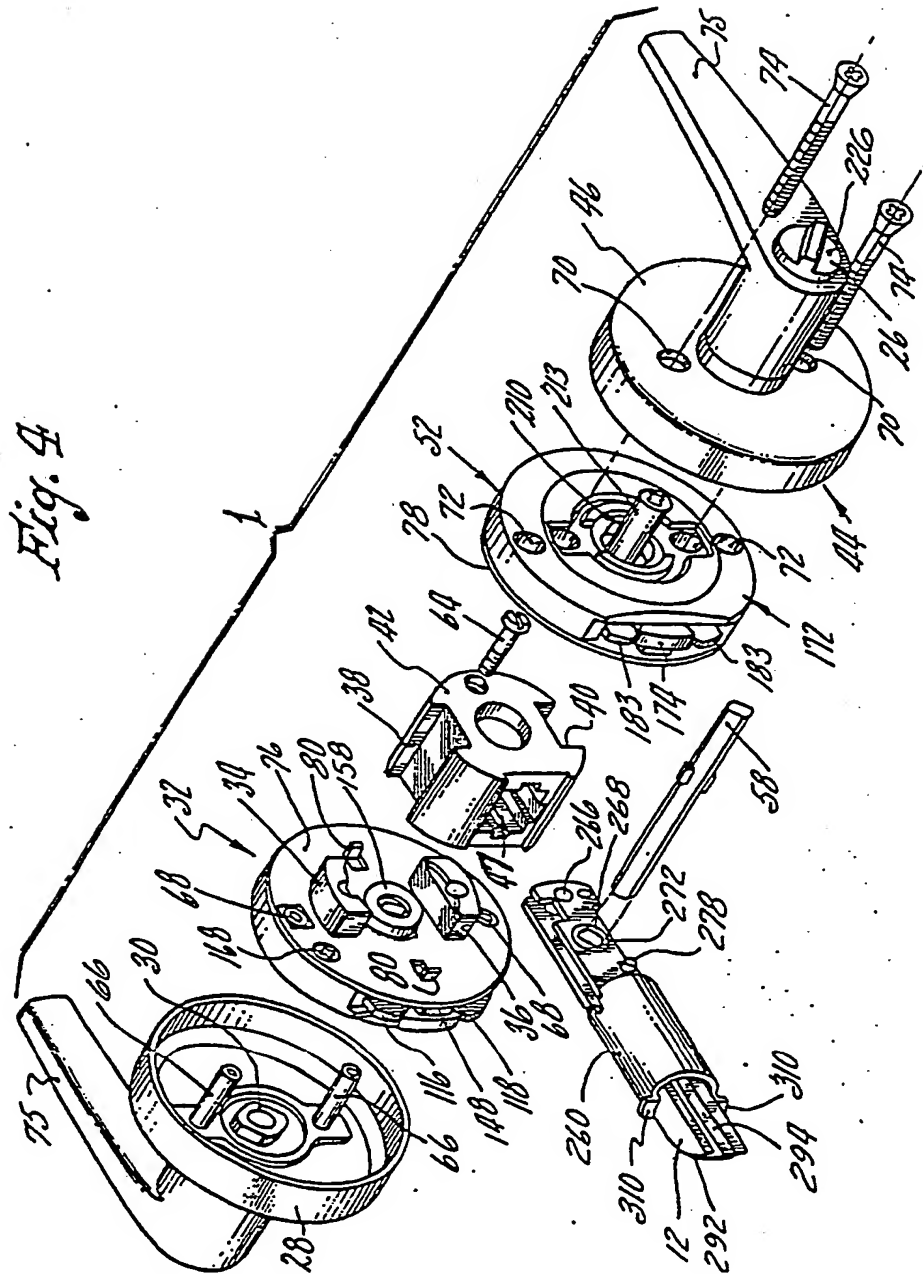


Fig. 5

